HIGH PRESSURE ICP/RF PLASMA SYSTEMS FOR NANO-MATERIALS PRODUCTION

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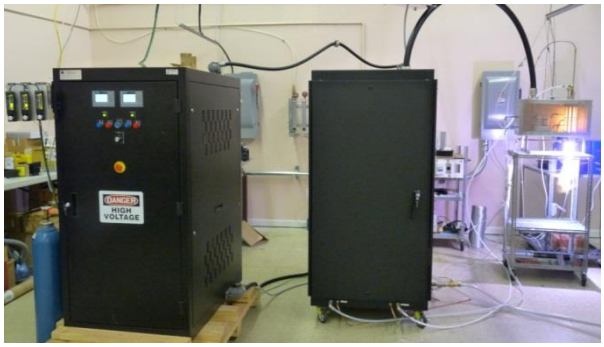
To investigate some promising plasma assisted processes at the elevated pressures Applied Plasma Technologies, Corp. has developed an inductively coupled (ICP) or radio frequency (RF) plasma system APT-60 with input power up to 60 kW and APT-100 with input power 100 kW.

General view of APT-100-2 is depicted in Fig.1.



a

b

Fig.1. APT-100-2: a) two-modular power supply with coaxial cable and capacitor bank combined with torch, b)high pressure reactor for boron nitride nano-tubes production with top mounted torch.

Among advantages of the newly developed systems are:

- High pressure operation (tested up to 7 bar) means higher plasma enthalpy, smaller reactors, high pressure output (no need in compression);
- Portable design and low gravimetric parameters. Total weight of the APT-100 power supply is 1,100 kg;
- Wide range of operation frequency – from 4 MHz to 7 MHz, what provides stable operation on different gases, including N_2, at elevated pressures;
- Remote ignition;
- Patented torch with direct and reverse plasma stabilization;
- Advanced control system with customer friendly data visualization;
- Contemporary and portable gas supply system - 190 x 190 x 200 mm for 3 gases;
- High thermal efficiency - up to 60%;
- Low cooling water flow – 30-40 liters per minute (over 120 l/min for TEKNA same power system).